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American Ferns—IV. The Genus Gymnogramme of the Synopsis Filicum

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For too long a period the study of systematic botany in America was in a more or less servile condition dominated by English ideas emanating mainly from Kew. A quarter of a century ago Asa Gray stood practically alone in the study of the higher flora of America. Bentham and Hooker's masterpiece, then about completed, was taken as authoritative, and the Kew rules dominated every action where personal preference did not supersede all rules. A little before this time had come the culmination of the work of a lifetime on the systematic study of ferns which was destined to exert a more wide-spread influence than Kew had exerted among the higher plants even. The *Species Filicum* of the elder Hooker which had followed the earlier publications of that distinguished man while he was associated with his still more acute compeer, Greville, had represented a lifetime of study on one of the largest collections of ferns that had ever been brought together, and was completed in 1864. The notes and corrections to this series added during the twenty years of publication had been incorporated in Hooker's own copy of the work, and he had commenced to bring out a revision in abridgement under the now familiar title of *Synopsis Filicum*, when his career was somewhat suddenly terminated by death. John Gilbert Baker, who afterwards became for many years the keeper of Kew herbarium, was entrusted to push this revision to a close, the first edition appearing in 1868, and the second with an extensive appendix in 1874. This work with its ample references to the more complete *Species Filicum* has had a remarkable and world-wide influence, and being the only general

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work containing a systematic treatment of the ferns of the entire world in a convenient form, has been adopted as a guide to practically all the great collections of ferns. On this account, but not without many silent and published protests, its conclusions regarding the limitations of both genera and species have been very widely adopted.

Protests against the irrational treatment of genera in this useful work are nothing new and did not originate far from the headquarters of the work itself, for no more vigorous restrictions have ever been drawn on its generic arrangement than those of John Smith, the distinguished gardener of Kew, where the present collection of living ferns notable among the great collections of the world, was largely brought together through the energy and influence of this careful worker and furnished the living material on which Smith based a generic system for ferns vastly more logical than anything that Kew has ever produced in the natural arrangement of this group. Smith's results do not differ very widely from those of Moore, another English protester against the Kew system; from those of Fée, the brilliant but somewhat isolated worker at Strasburg; and especially from those of the most liberal of all fern systematists, Carl B. Presl of Prag.

Were the specific limitations of the fern systematists at Kew to be characterized by a single word, it would be conglomeration—the essence of a practice somewhat vulgarly known as "lumping,"—and one who desires to do honest and critical work to-day is forced to unravel the tangles into which specific limitation has been twisted, in connection with the ample materials that this noblest of all fern collections affords, by tracing the threads of the tangle back to their original type localities, and by introducing into their understanding the element of geographic distribution which has always cut too slight a figure in the determinations of the Kew pteridographers. We can best illustrate this condition by a specific case. Under the species *Lomaria attenuata*, *Synopsis Filicum* gives (p. 176) the following distribution:

> "America from the West Indies and Guatemala southward to Brazil and Juan Fernandez; Polynesian Islands, Norfolk Island, Mauritius, Bourbon, Fernando Po and Cape Colony."

When we come to examine the specimens of this seemingly widespread species, which from the above statement, apparently disregards all known laws of geographic distribution, we find as we might expect that the species as treated at Kew is a conglomerate of several not very closely related species that have been miscellaneously grouped together, and the whole covered by what Dr. Giesenhagen has recently and not inappropriately called a "Kautschukdiagnose." We find that the original species bearing this name came from Mauritius whence it was originally described by Swartz (not Willdenow as the misleading practice of citing only the galvanizer instead of the original author would lead us to suspect) and was appropriately named *attenuata* from the long attenuate tip of the leaf which does not appear in the more common species of the West Indies, which all the botanists who have studied it down to the acute and lamented Jenman, following the misleading of Kew have confused with this characteristic Mauritian species which appears to be endemic in that island.* In a similar way another West Indian member of the same genus has been confused with *Lomaria procera* originally described from New Zealand, but which this comprehensive but inaccurate guide reports from

> "Mexico and West Indies southward to Chili; Malayan and Polynesian Islands, N. Zealand, S. Australia, Van Dieman's Land and S. Africa."

These are by no means isolated cases for the whole work bristles with such distributional absurdities, some even more pronounced.

In *Synopsis Filicum* more than in *Species Filicum*, there are many species reduced to synonymy frequently when the specimens had never been seen by the author. Kunze's species have been slaughtered wholesale and many of them will have to be revived, and the same is true of many of the species of Fée. In the Kew copy of the works of the latter author many of the species are penciled as being equivalent of this and that species already described, leaving scarcely any of them to stand as "good species." In a number of instances Mr. Baker has redescribed some of Fée's

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*With such a wide range of possibilities involved in the elastic description of *L. attenuata*, it is not surprising that even Mr. Davenport was misled by it into calling Pringle's no. 4999 *L. attenuata*, for surely it is little more diverse in general habit than some other things that have been included in this species, although Pringle's plant is properly a member of a distinct genus, *Plagiogyria biserrata*. The same error was copied by C. L. Smith in his Plantae Mexicanae, 2063, which is also *P. biserrata*.

species as new. In the case of *Acrostichum mollissimum* the Kew copy of Fée's notable work on the ferns of Brazil is marked opposite this species "= *Aubertii*," a plant originally described from Mauritius and naturally having nothing to do with the American species, although some recent fern writers have continued to call this an American species. When the same plant came in from St. Vincent collected by Smith, it was described as *Acrostichum Smithii* Baker, but it exactly matches both Fée's figure and his type. Up to the time of Baron Eggers' visit to the West Indies only one species of *Lygodium* had been described from Santo Domingo. This was figured by Plumier on plate 92 of his Traité des Fougères, and from his description and plate was called *Hydroglossum oligostachum* by Willdenow. The constant habit of neglecting type localities for species led the next specimens from this island collected by Eggers to be described as a new species, *Lygodium gracile* Baker. In addition to Eggers' specimen the plant had been collected on Santo Domingo by the botanists of the U. S. Commission of Inquiry, sent out when annexation was being considered, and specimens collected then are represented both in the U. S. National herbarium and in that of Columbia University. All these specimens represent one species and correspond admirably with Plumier's plate on which Willdenow's species was based.* I refer to this incident in this connection to emphasize the importance of the problem of type localities so often utterly neglected in systematic work among ferns.

Naturally this undue conglomeration at Kew has led to a wide misconception of the extent and diversity of fern species. In the second edition of *Synopsis Filicum* we have approximately 2,700 species of ferns described as representing "all known ferns" up to the year 1874. To these must be added the 1,100 species included by Mr. Baker in his supplementary list of new species published in 1891, and the 565 species of other pteridophytes from his Handbook of the Fern Allies (1887). This enumeration, however, is conservative and entirely inadequate. In the Schizaeaceae sixty species are included in *Synopsis Filicum ;* Prantl, who monographed this family in 1881, included eighty-nine species and that without having seen the Kew collection, which would have enabled him to add a number of species to his list. *Synopsis Filicum* gives twenty-two species of *Polypodium* § *Niphobolus.* In Giesenhagen's recent monograph of *Niphobolus* (1901) we have fifty species, and had he consulted the more ample range of materials in the Kew herbarium he would certainly have found additional species for his admirable monograph. In Kuhn's *Chaetopterides* nine species of *Jamesonia* are placed under the new genus *Psilogramme* where *Synopsis Filicum* had reduced them to one. From the collection of materials at Kew included there under the single cover marked *Aspidium juglandifolium* we have been forced to separate no less than eight well-marked species of *Phanerophlebia* and the tale is not all told yet. *Synopsis Filicum* reduced the world's species of *Botrychium* to six, and Mr. Baker reiterates this number in his summary of new ferns in 1891 ; Prantl enumerated fifteen species in his synopsis in 1884, and this number is still too small as we have now at least that number of well established species of the genus within the limits of the United States alone. A paper by Müller* describing six species in the small genus *Vittaria* has been entirely passed over in both *Species Filicum* and *Synopsis Filicum.* In *Die natürlichen Pflanzenfamilien* (1901) Hieronymus gives 559 species of *Selaginella* against the 335 species recorded by Baker in 1887. Such examples as these show the extreme conservatism and incompleteness of this work and it is more than likely that when the next enumeration of the pteridophytes is made the number of existing species will reach six thousand, and perhaps more, for the species published as new during the last decade form a surprising list.

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* The synonymy of this species will then be:

LYGODIUM OLIGOSTACHYUM (Willd.) Desv. Ann. Soc. Linn. de Paris, **6**: 205. 1827

Hydroglossum oligostachyum Willd. Sp. Pl. 5: 81. 1810.

Lygodium gracile Baker, Jour. Bot. **26**: 35. 1888.

The further exploration of the island of Haiti will doubtless clear up many mysteries concerning ferns based on Plumier's plates.

But it is the treatment of genera in this work that we wish more especially to consider, for there could scarcely be a more unnatural or artificial system of genera than the *Synopsis Filicum* contains following almost exactly the lead of the earlier *Species Filicum.* It is not too much to say that for the pteridophytes it represents a system as antiquated and artificial as the so-called sexual system of Linnaeus for flowering plants.

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* Müller, K. : Einige Worte über die Bedeutung des Zellenbaues für die Klassifikation, nebst Beschreibung sechs neuer arten der Farnngattung *Vittaria.* Bot. Zeitung, 12 : 537–548. 1854.

As might be expected *Synopsis Filicum* is moulded on the old conceptual idea that a genus is a definition framed in set characters, instead of the modern evolutionary idea that a genus is a group of closely related species. This of necessity reduces the author's position to the inclusion of notorious absurdities. Having defined *Polypodium* as with "Sori on the back of the lobes, round or rarely oblong, not more than twice as long as broad," it becomes necessary to include in one genus such diverse plants as *Dipteris*, *Phegopteris Dryopteris*, *Arthropteris tenella*, *Cyclophorus acrostichoides*, and *Cheiropteris palmatopedata* in the same genus with *Polypodium vulgare* irrespective of any other character than the possession of round and naked sori!

Habit also plays little part in the arrangement of genera and subgenera in the Hookerian system. Note if you will a striking example presented in the section *Hemidictyum* of the immense and cumbrous genus *Asplenium.* This is characterized as having "Veins anastomosing towards the margin. Sori single" and among its four species two such absolutely diverse plants as *Ceterach** and *Hemidictyum marginatum* are included. If we should search the whole range of the Polypodiaceae we could scarcely find two species more remote in their natural affinities, and yet here they stand not only in the same genus but in the same subgenus placed almost side by side! There is nothing more astoundingly incongruous in the whole Linnaean system.

Among the many incongruities among genera, the genus *Gymnogramme* is one of the most irrational and unnatural conglomerations that appear in the *Synopsis Filicum.* It forms the largest genus of the tribe Grammitideae of the Hookerian arrangement with *Notholaena*, *Monogramma*, *Antrophyum*, *Vittaria*, *Hemionitis*, and several smaller genera, associated in this tribe by the possession of sporangia arranged in lines not covered by an indusium. In this way the most variable and ephemeral of all the structures possessed by the ferns, namely the membranous indusium which as a peripheral structure, a mere flattened trichome, more subject to variation than any other single structure, is made the artificial character by which genera are united into tribes and by which the individual genera are characterized, to the exclusion of real characters based on more fundamental portions of the plant anatomy or on habit relations which so often are real guides to blood relationship. *Notholaena* is simply a non-indusiate complex of the *Pterideae*, in part related to *Cheilanthes* and in part related to *Pellaea;* *Vittaria* is properly the type of a tribe in which some of the smaller genera will associate themselves; while *Gymnogramme* as represented by the ninety-eight species described in *Synopsis Filicum* is the most unaccountable and unnatural collection of misfits that ever figured in the pages of a treatise on systematic botany. With the possible exception of *Hemionitis*, no part of *Gymnogramme* as here treated has any natural relation to the other genera with which it is associated, and the removal of its broken fragments almost bodily to the tribe Pterideae by Diels in his treatment of the family in *Die natürlichen Pflanzenfamilien* give them no more secure a resting-place, for the diverse sections of the genus are related some to one tribal alliance and some to another, while some may have to form a tribe by themselves with no very close relations to any other known forms.

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* The near allies of *Ceterach* which forms a distinct genus whose name is dependent on the settlement of the question of generic types, are strangely scattered in *Synopsis Filicum.* In addition to the common European species they are *Asplenium alternans* which there appears under § *Euasplenium.* *A. aureum* which appears as a subspecies of *A. Ceterach;* and *Gymnogramme cordata* which appears in a distinct tribe as its indusium is wanting. Thus are natural relationships violated by the establishment of artificial lines and genera which are limited by definition only.

The genus *Gymnogramma* was established by Desvaux * in 1811 based on thirteen species in the order named below:

Sec. 1. *Frondibus pinnatis.*
1. G. RUFA (*Pteris ruffa* L., *Acrostichum rufum* L.).
2. G. TOMENTOSA (*Asplenium tomentosum* Lam.).
3. G. ACROSTICHOIDES (*Hemienitis acrostichoides* Sw.).
Sec. 2. *Frondibus bipinnatifidis.*
4. G. FILIPENDULAEFOLIA (*Asplenium filipendulaefolium* Aubert).
5. G. TRIFOLIATA (*Acrostichum trifoliatum* L.).
Sec. 3. *Frondibus bipinnatis.*
6. G. JAPONICA (*Hemionitis Japonica* Thunb.).

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* **Desvaux,** Berl. Mag. 5: 304. 1811. (Copy in the New York Public Library.)

7. G. LEPTOPHYLLA (*Polypodium leptophyllum* L.).

Sec. 4. *Frondibus tripinnatifidis.*

8. G. CHAEROPHYLLA Desv.
9. G. TARTAREA (*Acrostichum tartareum* Cav., *Hemionitis dealbata* Willd.).
10. G. SULPHUREA (*Acrostichum sulphureum* Sw.).
11. G. AUREA (*Hemionitis aurea* Willd.).

Sec. 5. *Frondibus decompositis.*

12. G. ROSEA (*Hemionitis argentea* Willd.).
13. G. FLEXUOSA Desv.

It thus contains representatives of six or more genera as now understood, and the species were arranged, as was common during the first quarter of the last century, in the inverse order of complexity of leaf division. The first species mentioned under *Gymnogramma* was *Pteris ruffa* L., which thirteen years earlier had stood as the sole type of the genus *Gymnopteris* established by Bernhardi.* The latter name must therefore stand for the group which contains its monotype in spite of the fact that various botanists, including Diels, who wrote the Polypodiaceae for *Die natürlichen Pflanzenfamilien*, have used *Gymnopteris* for an entirely different group of plants. Whether the name *Gymnogramma* must pass forever into synonymy or be applied to some of the other species it originally contained, will be dependent on the final settlement of the question of generic types. And not only this, but the settlement of this problem will also affect all the generic groups later established on any of the species involved in the original *Gymnogramma*. There can never be generic stability until this problem is eternally settled, and the only ground on which it ever can be settled is in our own country, and the only body that can ever settle it are the botanists of America. Should American botanists take a stand in this matter that can be agreed upon it matters not whether the slower conservatives of Europe follow or not.

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* As Bernhardi's genus is cited as late as 1875 by no less an authority on ferns than John Smith himself (Historia Filicum, p. 138) as "founded by Bernhardi in 1800, on the *Acrostichum quercifolium* of Retzius" it is desirable to know exactly what Bernhardi did in Jour. für die Botanik, 1799: 297. 1799 (not 1800: 121, as cited by Pfeiffer!). His genus *Gymnopteris* is no. 3 and is placed under "*I. Sporangiis gyro instructis*" and under "*A. Nudis,*" as follows:

"3. GYMNOPTERIS. *Sporangia* pedicellata lineatim aggregata. E. g., Acrostichium *rufum* L."

It was not till 1806 that Bernhardi (Neues Journal für die Botanik, 1^2 : 20) gave a new account of *Gymnopteris* under which he cites two species by name "Gymnopteris *discolor* (Osmunda Forst.)" and "* * * quercifolia (Acrostichum Retz.)" among numerous other groups which he denominates as "familiae" under the genus.

The only safety in accurate systematic work is to consult the original papers where genera and species are described. We cannot depend on many of the traditional ideas based on ancient and hurried examination of original descriptions without a new verification of their data.

Following the numbered species of *Gymnogramme* in *Synopsis Filicum* over twenty have stood as the types * of genera already established:

No. 2. Leptogramma J. Sm., 1841. (Includes also nos. 1–11.)
No. 12. Digrammaria Presl, 1836.
No. 13. Stegnogramma Blume, 1828.
No. 14. Pterozonium Fée, 1850–52; also the first species under *Trichiogramme* Kuhn, 1882. Represented also by *P. cyclophylla*, a second South American species.
No. 15. Austrogramme Fourn., 1873.
No. 16. Hecistopteris J. Sm., 1842.
No. 19. Gymnopteris Bernh., 1799; also the first species mentioned under *Gymnogramma* Desv., 1811, and *Neurogramma* Link, 1841. (Includes also nos. 17, 18, 23, 32.)
No. 21. Pleurosorus Fée, 1850–52.
No. 24. Psilogramme Kuhn, 1882. (Includes also nos. 25–30, 36, 38–42, 48–49.)
No. 31. Aspleniopsis Mett., 1882.
No. 35. Coniogramme † Fée, 1850–52.
No. 37. Eriosorus Fée, 1850–52.
No. 44. Anogramma Link, 1841. (Includes also nos. 45, 46.)
No. 51. Trismeria Fée, 1850–52.
No. 54. Ceropteris Link, 1841. (Includes also nos. 52–57.)
No. 62. Syngramma J. Sm., 1845. (Includes also nos. 58–65.)
No. 66. Synammia Presl, 1836.‡
No. 76. Selliguea Bory, 1824. (Includes also nos. 68–82.)
No. 83. Dictyogramme Fée, 1850–52.
No. 84. Bommeria Fourn, 1876. (Includes also no. 43.)

Besides this No. 20 is a species of *Ceterach*, No. 33 (*Gymnogramme Houghtoni* Hook.) may belong to the same genus, and two or three others are too little known to enable us to be certain of their relations.

These facts alone will show that there has been a decided opposition in almost every quarter against the Kew conception of this genus and it is to be said that the genera named above represent in most cases valid genera. Of the series, *Digrammaria*, *Stegnogramma*, *Aspleniopsis*, *Coniogramme*, *Syngramma*, and presumably *Selliguea* and *Dictyogramme* represent exclusively Old World genera. *Leptogramma*, *Austrogramme*, *Pleurosorus*, *Gymnopteris*, *Anogramma*, and *Ceropteris* are found on both continents; while *Pterozonium*, *Hecistopteris*, *Psilogramme*, *Bommeria*, *Trismeria*, and *Synammia* are so far as known exclusively American. The genera and species represented in North America are as follows:

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* By type I mean here the first species described under the genus where no type is stated or implied.

† *Coniogramme* was founded on three species of which *C. Javanica* is first figured. Diels has united *Dictyogramme* with this and indicates only a single free-veined species while there are evidently several.

‡ Presl founded this on two species, *Grammitis elongata* Sw. and *Polypodium trilobum* Cav., figuring the latter. John Smith in reviewing Presl's work refers the first species perhaps probably to *Phymatodes* and limits Presl's genus to the second.

I. LEPTOGRAMMA J. Sm.; Hook. Jour. Bot. **4**: 51. 1841

(Based on *L. asplenoides* (Sw.) and six other species.)

1. LEPTOGRAMMA PILOSUM (Mart. & Gal.)

Gymnogramme pilosa Mart. & Gal. Mem. Acad. Sci. Bruxelles, **15**: — (27). *pl. 4. f. 1.* 1842. (Type from Orizaba, *Galeotti, 6267, 6268.*)

Hab. Mexico.

2. LEPTOGRAMMA LINKIANUM (Presl) J. Sm.; Hook. Jour. Bot. **4**: 52. 1841

Grammitis Linkiana Presl, Tent. Pterid. 209. 1836.

Gymnogramme Linkiana Kunze, Linnaea, **18**: 310. 1844.

Hab. Mexico.

Confused in *Synopsis Filicum* with *L. diplazioides* (Desv.) from Haiti, as is also *Leptogramma rupestre* Klotzsch, Linnaea, **20**: 415. 1847, from Colombia, likewise a distinct species.

3. LEPTOGRAMMA GRACILE (Heward) J. Sm.; Hook. Jour. Bot. **4**: 52. 1841

Gymnogramma gracile Heward, Mag. Nat. Hist. II. **2**: 457. 1838.

Hab. Jamaica.

4. **Leptogramma diplazioides** (Desv.)

Gymnogramma diplazioides Desv. Ann. Soc. Linn. de Paris, **6**: 214. 1827.

Hab. West Indies to South America.

It is probable that this list will be somewhat extended when Fée's collection becomes better known.

As stated in an earlier paper of this series this genus is closely related to *Phegopteris* and will form a member of the tribe *Aspidieae*. It has no near relation to any other group of this group.

II. HECISTOPTERIS J. Sm. Lond. Jour. Bot. 1: 193. 1842

(Monotypic)

1. HECISTOPTERIS PUMILA (Spreng.) J. Sm. Lond. Jour. Bot. 1: 193. 1842

Gymnogramma pumila Spreng. Tent. Supp. ad Syst. Veg. Linn. 31. 1828. (Type from Guiana.)

Hab. Trinidad and Guatemala to Guiana.

This genus has somewhat uncertain relations. Diels places it among the VITTARIEAE, with which it has doubtful affinity.

III. GYMNOPTERIS Bernh. Schrader's Jour. für die Botanik, 1799: 297. 1799

(Monotypic, based on *Pteris ruffa* L. =*Acrostichum rufum* L.*)

1. GYMNOPTERIS RUFA (L.) Bernh. Schrader's Jour. 1799: 297. 1799

Pteris ruffa L. Sp. Pl. 1074. 1753. (Based on Sloan, *pl. 45.f. 1*, from Jamaica.)

Acrostichum rufum L. Sp. Pl. ed. 2, 1525. 1763.

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* Besides the North American species the genus *Gymnopteris* contains the following:

Gymnopteris tomentosa (Lam.)

Asplenium tomentosum Lam. Encyc. Meth. Bot. 2: 308. 1786. (*Type* from Brazil.)

Gymnopteris vestita (Wall.)

Grammitis vestita Wall. Cat. Pl. n. 12. 1828. (Type from India.)

Gymnogramme vestita Hook. Ic. Pl. 2: *pl. 115*. 1837.

Gymnopteris Mülleri (Hook.)

Gymnogramme Mülleri Hook. Sp. Fil. 5: 143. *pl. 295*. 1864. (Type from Australia. *F. Müller.*)

Gymnopteris Gardneri (Baker)

Gymnogramme Gardneri Baker, Syn. Fil., Ed. 2, 515. 1874. (Type from Brazil, *Gardner, 4077.*)

Gymnopteris Delavayi (Baker)

Gymnogramme Delavayi Baker, Annals Bot. 5: 484. 1891. (Type from Yunnan, China, *Delavay.*)

Hab. West Indies from Cuba and Jamaica to Guatemala, Honduras, Nicaragua, and throughout South America to Paraguay.

2. **Gymnopteris subcordata** (D. C. Eaton & Dav.)

Gymnogramme subcordata D. C. Eaton & Dav. Contr. U. S. Nat. Herb. **5**: 138. *pl. 16.* 1897.

Hab. Mexico, Ymala and Lodiego, *Palmer.*

3. **Gypmnopteris ferruginea** (Kunze)

Gymnogramme ferruginea Kunze, Linnaea **9**: 34. 1835. (Type from Peru, *Poeppig.*)

Hab. Guatemala to Peru.

IV. PSILOGRAMME Kuhn, Chaetop. 12. 1882

(Based on *Gymnogramme elongata* Hook. & Grev. and twenty-two other species.*)

1. PSILOGRAMME WARSCEWICZII (Mett.) Kuhn, Chaetop. 17. 1882

Gymnogramme Warscewiczii Mett. Ann. sc. nat. V. **2**: 211. 1864. (Type from Colombia.)

Hab. Costa Rica to Colombia.

2. PSILOGRAMME FLEXUOSA (H.B.K.) Kuhn, Chaetop. 19. 1882

Grammitis flexuosa H.B.K. Pl. Aequin. **2**: 167. *pl. 138.* 1809. (Type from Caracas.)

Cryptogramma retrofracta Hook. & Grev. Bot. Misc. **3**: 385. *pl. 112.* 1833. (Type from Peru.)

Hab. Costa Rica to Bolivia.

3. **Psilogramme Domingensis** (Baker).

Gymnogramme Domingensis Baker, Annals Bot. **5**: 485. 1891. (Type from Causal, Santo Domingo.)

Hab. Santo Domingo.

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* In founding the genus *Psilogramme,* Kuhn commits the error of absorbing an earlier named genus, extending its characters, and placing the whole under a new name. He divides his genus into two sections: § 1, *Jamesonia,* which is a valid genus established by Hooker and Greville, and § 2, *Eupsilogramme.* By this saving word he indicated what species he regarded as typical of his new genus and we take up here his *Psilogramme* in a narrower sense than originally established by excluding the Andine *Jamesonia* which even at Kew has always been regarded a valid genus. As here taken up *Psilogramme* is nearly the equivalent of *Gymnogramme* § *Eugymnogramme* of *Die natürlichen Pflanzenfamilien,* although Kuhn (1882) had restricted the genus *Gymnogramme* to what Link in 1841 called *Anogramma.* In *Die natürlichen Pflanzenfamilien* and in this paper Link's genus is accepted as valid.

4. **Psilogramme schizophylla** (Baker)

Gymnogramme schizophylla Baker, Jour. Bot. **15**: 266. 1877. (Type from Jamaica, *Jenman, 16.*)

Hab. Jamaica.

The synonymy of the other species which are South American may be found in Kuhn, *loc. cit.*

V. ANOGRAMMA Link, Fil. Sp. in Hort. reg. bot. Berl. 137. 1841

(Based on *Gymnogramma leptophylla* and *G. chaerophylla.*)

1. ANOGRAMMA LEPTOPHYLLUM (L.) Link, *l. c.* 137

Polypodium leptophyllum L. Sp. Pl. 1092. 1753. (Type from southern France.)

Hab. West Indies, Mexico; Mediterranean region, Canaries, Madeira.

2. ANOGRAMMA CHAEROPHYLLUM (Desv.) Link, *l. c.* 138

Gymnogramma chaerophylla Desv. Berl. Mag. **5**: 305. 1811.

Hab. West Indies to Paraguay.

The Guatemalan specimens referred to this species in *Synopsis Filicum* are fragmentary, but indicate a possibly distinct species.

VI. TRISMERIA Fée, Genera Filicum, 164. 1850–52

(Based on three species of which *Acrostichum trifoliatum* Pohl is first as *T. argentea; Acrostichum trifoliatum* L. is second as *T. aurea;* and *T. microphylla* Fée, *l. c.* 165, from Peru is the third.)

1. TRISMERIA TRIFOLIATA (L.) Diels. * Die nat. Pflanzenf. $\mathbf{1}^4$: 365. 1899

Acrostichum trifoliatum L. Sp. Pl. 1070. 1753.

Trismeria aurea Fée, Genera Filicum, 165. 1850–52.

Hab. West Indies to Brazil.

Species with silvery powder as indicated by Fée are unknown to me in collections. A second species, *Trismeria longipes* (Baker) Diels., occurs in Paraguay.

VII. CEROPTERIS Link, Fil. Sp. in Hort. reg. bot. Berol. cult. 141. 1841

(Based on five species of which *C. calomelaena* is first named.)

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* Diels, *loc. cit.*, credits this species to Fée, but Fée did not take up the Linnaean name.

Synopsis of the North American Species

- Leaves more or less pentagonal in outline.
  - Lower basal divisions of lowest pinnae deeply pinnatifid; powder yellow or rarely white; upper surface smooth, dark green. 1. *C. triangularis.*
  - Lower basal divisions of lowest pinnae only slightly sinuate-lobed; powder white; upper surface viscous. 2. *C. viscosa.*
- Leaves elongate-triangular or lanceolate-ovate in outline.
  - Venation distinctly pinnate.
    - Pinnules blunt, entire or with rounded lobes at the base; powder white.
      - Texture coriaceous or firm; pinnules broad, usually expanded. 3. *C. tartarea.*
      - Texture herbaceous; pinnules smaller and narrower with strongly revolute margins. 4. *C. Peruviana.*
    - Pinnules acute, entire or with one or more acute lobes at base.
      - Powder white. 5. *C. calomelanos.*
      - Powder golden yellow. 6. *C. chrysophylla.*
  - Venation flabellate or pseudo-flabellate.
    - Powder white. 7. *C. triangulata.*
    - Powder yellow. 8. *C. sulphurea.*

1. **Ceropteris triangularis** (Kaulf.)

Gymnogramma triangulare Kaulf. Enum. Fil. 73. 1824.

Stipes densely clustered from a very short rootstock, pale chestnut brown or sometimes blackish; lamina pentagonal, 4–10 cm. long, equally wide, with 6–7 pairs of opposite pinnae gradually ending in a short apex: lowest pinnae unequally triangular, the lowest outer divisions much produced, broad, pinnatifid, the segments on the lower side considerably larger, the upper divisions more or less pinnatifid, all with broad segments; second pair of pinnae lanceolate, pinnatifid with broad short segments, the lowest outer division scarcely produced; upper pinnae becoming merely sinuate or the extreme uppermost entire; upper surface smooth; lower surface covered with yellow or occasionally white powder: sporangia in lines following the forking veins, sometimes confluent when old.

Hab. California to Alaska (?); common. Commonly known as the "gold fern" or "golden back."

In the Kew herbarium there are three scrappy Nuttallian specimens each marked with an asterisk and a name in Nuttall's characteristic hand. Two of these are from Oregon and the third is from Santa Barbara, California. One of the Oregon specimens marked "**viscosa*" is apparently the same as *var. viscosa* of D. C. Eaton, which we can now with more ample materials separate as a distinct species. All of Nuttall's forms have white powder and that feature is not uncommon in *C. triangularis.* There are, however, indications in our collections of a third species with white powder from Lower California.

2. **Ceropteris viscosa** (D. C. Eaton)

Gymnogramme triangularis var. *viscosa* D. C. Eaton, Ferns of N. Am. **2**: 16. *pl. 48. f. 5.* 1880.

Stipes clustered from a very short rootstock, chestnut brown, shining, slender: lamina more or less pentagonal with 6–7 pairs of pinnae which disappear gradually in the more or less tapering apex; lowest pair of pinnae deeply pinnatifid, the lowest basal divisions elongate and slightly and irregularly sinuate or lobed, the remaining divisions almost entire; second pair of pinnae pinnatifid with the lowest outer division mostly narrow and elongate, upper pinnae becoming less and less pinnatifid, the uppermost almost entire; upper surface viscous; lower surface covered with white powder; sporangia on the veins, soon confluent.

Hab. California. The following collections have been examined: So. California, 1888, *J. G. Lemmon;* Temecula, 1 May, 1893, *W. G. Wright;* Santa Catalina Island, 1889, *Georgia M. Rose* (all in herb. Underwood); Avalon, Santa Catalina Island, March, 1901, *Blanche Trask* (herb. New York Botanical Garden). In the herbarium of Columbia University is a single leaf of this species collected at "San Diego, Dry Hills," by C. C. Parry, on the Mexican Boundary Survey.

3. CEROPTERIS TARTAREA (Cav.) Link, Fil. Sp. in Hort. reg. bot. Berol. cult. 141. 1841

Acrostichum tartareum Cav. Descr. de las Plantas, 242. 1801. (Type from Peru.)

Hab. West Indies and Mexico to Peru.

In a paper by B. Shimek * this species, wrongly attributed to Linnaeus, is reduced to a variety of *C. calomelanos* as had hitherto been advocated by Baker and others, but the two are abundantly distinct, as can be seen by the study of any large collection.

4. CEROPTERIS PERUVIANA (Desv.) Link, Fil. Sp. in Hort. reg. bot. Berol. cult. 142. 1841

Gymnogramma Peruviana Desv. Berl. Mag. **5**: 329. 1811. (Type from Peru.)

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*The Ferns of Nicaragua. Bull. Lab. Nat. Hist. State Univ. Iowa, **4**: 191. 1891.

Ceropteris plicata Fée, Mem. **8**: 81. 1857.

Ceropteris Schaffneri Fée, Mem. **8**: 80. 1857.

We have examined North American specimens as follows:

VERA CRUZ: Orizaba, *Müller, 1643;* Calcareous bluffs near Orizaba, 4000 ft., *Pringle, 6078.*

JALISCO: Gravelly bluffs near San Marcos, *Pringle, 4377.*

Both in the herbarium of Columbia University.

5. CEROPTERIS CALOMELANOS (L.) Link Fil. Sp. in Hort. reg. bot. Berol. cult. 141. 1841 (as *C. calomelaena*)

Acrostichum calomelanos L. Sp. Pl. 1072. 1753. (Type from West Indies based on Sloan, *pl. 30. f. 2* and Plumier, *pl. 40.*)

Hab. West Indies, general, and Mexico to Brazil.

6. CEROPTERIS CHRYSOPHYLLA (Sw.) Link, Fil. Sp. in Hort. reg. bot. Berol. cult. 143. 1841

Acrostichum chrysophyllum Sw. Fl. Ind. occ. **3**: 1598. 1806. (Type from Martinique, based on Plumier, *pl. 44.*)

Hab. West Indies.

Although not covered beneath by a waxy powder but in the young state by fine rusty hairs, is it probable that *Gymnogramme. Hookeri* J. Sm. belongs to this genus as it agrees perfectly in habit and every other character save this. A single specimen occurs in the collection of the New York Botanical Garden. *Gymnogramme Bommeri* Christ from Costa Rica which we have not seen may also belong here. Other species of gold .and silver ferns from South America occur in collections and there are indications of two or three additional species from Central America and the West Indies, but present material is too scanty for properly characterizing the latter.

7. **Ceropteris triangulata** (Jenm.)

Gymnogramme triangulata Jenm. Bull. Bot. Dep. Jamaica, **4**: 206. 1897. (Type from Moody's Gap, Jamaica.)

Hab. Jamaica, Moody's Gap, 1900, *Clute, 162.* (Herb. Underwood.)

8. CEROPTERIS SULPHUREA (Sw.) Fée, Gen. Fil. 183. 1850–1852

Acrostichum sulphureum Sw. Nov. Gen. & Sp. Pl. 129. 1788. (Type from Jamaica.)

Hab. West Indies.

The last species with another from Africa is placed by Diels in a genus distinct from the other gold and silver ferns but the preceding species is quite intermediate between this and the other West Indian species in its venation.

VIII. BOMMERIA Fourn.; Baillon, Dict. de Bot. **1**: 448. 1876. Bull. Soc. Bot. de France, **27**: 327. 1880

(Based on *Gymnogramme Ehrenbergiana* Mett. and *G. pedata* Kaulf.)

1. BOMMERIA EHRENBERGIANA (Klotzsch) Fourn. Bull. Bot. Soc. de France, **27**: 328. 1880

Stenogramme Ehrenbergiana Klotzsch, Linnaea, **20**: 411. 1847. (Type from Mexico, *Ehrenberg, 662.*)

Gymnogramme podophylla Hook. Syn. Fil. **5**: 152. *pl. 296.* 1864. (Type from Orizaba, *Müller, 719.*)

Hab. Mexico. A single, sterile leaf occurs in the Meissner herbarium (Columbia University).

2. **Bommeria hispida** (Mett.)

Gymnogramme hispida Mett. Linnaea, **36**: 72. 1869. (Type from New Mexico, *Wright, 819.*)

Bommeria Schaffneri Fourn. Bull. Bot. Soc. de France, **27**: 327. 1880. (Type from Escabrillos prope San Luis Potosi, *Schaffner, 6.*)

Hab. New Mexico and Arizona to Central Mexico.

3. BOMMERIA PEDATA (Sw.) Fourn. Bull. Bot. Soc. de France, **27**: 327. 1880

Hemionitis pedata Sw. Syn. Fil. 20. 209. *pl. 1. f. 3.* 1806. (Original country unknown to Swartz but the original specimen had been sent to him by Cavanilles.)

Hab. Mexico.

The first species has anastomosing veins while in the others the veins are free; until the type species of the genus is better known it will be somewhat uncertain whether all the species thus aggregated together by Fournier should thus remain. They are all characterized by a pedate habit.

The American species (*Gymnogramme elongata* (no. 66) and *G. Mexicana* (no. 67) which are referred in *Synopsis Filicum* to §

Selliguea have little in common with the old world representatives of that genus. While no. 66 was the type of *Synammia* Presl, it has been referred to *Phymatodes* by John Smith, and surely this treatment is quite satisfactory, as the plant differs from *Phymatodes* only in its slightly elongated sori. *G. Mexicana*, judging from Fée's figures, will follow *G. elongata*. *Gymnogramme heterophlebia* Gilbert, Bull. Torrey Club, **26**: 325. 1897, from Venezuela, is another species of *Phymatodes* described long ago from South America as *Polypodium persicariaefolium* Schrad., so that *Selliguea* based by Bory on *S. Feei* from Java is to be regarded as an exclusively old world genus.

SUMMARY

1. The genus *Gymnogramme* as treated at Kew, far from being a natural group of plants, contains among its species a number of generic groups, several of which bear no close phylogenetic relations to the others or to each other; some of these belong to different tribes even.

2. Certain of these genera are related to the *Polypodieae*, others to the *Aspidieae*, one possibly to the *Vittarieae*, but more are distinctly related to the *Asplenieae*, possessing every asplenioid character except the indusium.

3. The tribe Grammitideae as recognized in *Synopsis Filicum* has no good ground for recognition as a natural group of genera.

4. The members of *Gymnogramme* of the *Synopsis Filicum* have little relationship with the tribe Pterideae with which, for the most part, they are associated in *Die natürlichen Pflanzenfamilien*.

5. The name *Gymnogramma* being a typonym of the monotypic *Gymnopteris* established thirteen years earlier, disappears from botanical nomenclature.

6. While the genera are largely represented in the American tropics, some belong exclusively to the old world, and others have a wide distribution throughout tropical and warm temperate regions.

7. The two species hitherto referred to *Gymnogramme* occurring within the limits of the United States represent two distinct genera, *Ceropteris* and *Bommeria*. A third species (*Ceropteris viscosa*) is added from southern California.

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